ABSTRACT

A splicing system for joining polarization-maintaining, single mode optical fibers produces durable fusion splices that have low transmission loss and maintain mode integrity. The system employs active optical techniques such as profile alignment or local injection and detection to achieve optimized lateral alignment of the fibers prior to fusion. Azimuthal alignment is performed using a transverse, polarized light illumination and detection system. Each fiber is rotated azimuthally to determine a transverse intensity function. The transverse intensity functions of the respective fibers are cross-correlated to determine a relative orientation that matches the polarization axes of the fibers. After the relative position of the fibers is manipulated laterally, axially, and azimuthally, the fibers are fusion spliced using an electric arc discharge. The accurate alignment achievable using the transverse illumination mechanism to drive adaptive fiber positioning affords a method for reliably producing low loss, mode-matched splices. Simplicity of design and operation make the system rugged and enable accurate alignment and low loss fusion of fibers under adverse working conditions.